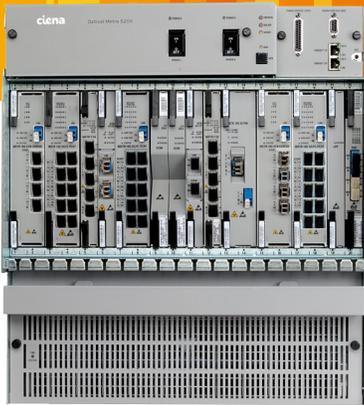


5100, 5200 ADVANCED SERVICES PLATFORM

for Enterprises



Features & Benefits

- **Convergence design simplicity:** Design and optimization of small to mid-sized WDM networks with the assistance of planning tools
- **Multi-application platform:** Network convergence via complete bit-rate and protocol independence support for secure transport over a single, scalable WDM infrastructure; monitoring of network performance
- **Reduced Total Cost of Ownership (TCO):** Straightforward architecture for optimized footprint and wavelength utilization, with a cost-optimized CWDM solution for smaller networks and enterprise access applications
- **Fault-tolerant, reliable architecture:** Field-proven, high-availability (99.999 percent) product, built to industry standards for the support of mission-critical services (< 50 msec fault recovery, GDPS® and NEBS/ETSI compliant, in-service upgrades and more)
- **Scalable platform:** Adaptable to smaller and/or larger networks with simple provisioning of wavelengths on an as-needed basis; cost-effective initial deployment with modular growth

The 5100 and 5200 are the leading convergence platforms for Wavelength Division Multiplexing (WDM) applications. Converging multiple networks into a simple, scalable and secure network has never been so affordable and simple. The 5100 and 5200 offer an open, scalable, high-availability (99.999 percent) architecture ideal for applications such as business continuity and disaster recovery, Ethernet transport, optical storage connectivity and fiber relief.

With optical-in/optical-out infrastructure, the bit rate- and protocol-independent interfaces can support any application either transparently over a WDM network or mapped to Generic Framing Procedure (GFP) for transmission over a service provider's existing SONET/SDH infrastructure. The 5100 and 5200 use common hardware interfaces and software for deployment, sparing and management simplicity. Managing the increasing volumes of data continuously generated by corporations today can seem like an overwhelming task. Enterprises require leading-edge, flexible networks to meet their growing business and data needs.

The 5100 and 5200 offer such a solution. The platform supports the transparent transport of any application using native protocols and the convergence of multiple networks into a simple, scalable and secure network. This platform extends optical connectivity from the enterprise edge to the metro core. As shown in Figure 1, the 5100 and 5200 offer enterprises the following: a scalable converged WDM platform, reduced Total Cost of Ownership (TCO) through network simplification and a secure solution for the delivery of mission-critical applications.

Features & Benefits continued

- **Flexible networking capabilities:** Interconnected systems architecture for end-to-end effective networking and lower CAPEX/OPEX; support for all types of networking topologies, including point-to-point, ring and mesh
- **ITU standards-based services:** OTN/SONET/SDH/GFP-framed interfaces for networking across heterogeneous service provider transport networks
- **Bandwidth efficiency:** Various types of Multi-rate Optical Transponders (MOTRs) allowing different client signals to be carried over a single wavelength
- **Cost-effective and highly reliable:** GbE connectivity with a complete set of monitoring and management tools
- **Encryption services:** Secure wire-speed encryption with multi-protocol, multi-rate tunable transponder ports capable of carrying 8/10G FC, PSIFB, 10GE LAN/WAN, OC-192/STM-64 and OTU-2 services



5100 shelf

Scalable Platform:

Delivering a comprehensive set of services and applications

Simple Architecture:

Reducing the TCO

Secure System:

Service assurance for mission-critical data and applications

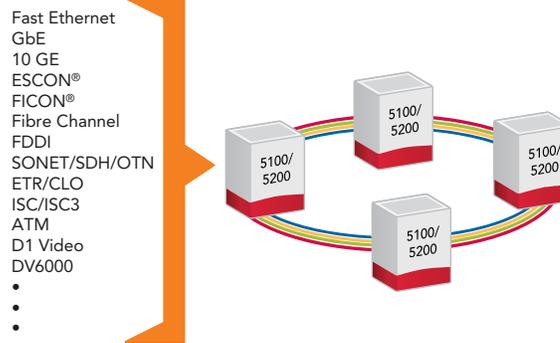


Figure 1. 5100/5200 platform

Application Flexibility with Protocol Independence

The versatile 5100 and 5200 provide significant density and flexibility options with compelling economics for enterprises providing a variety of network applications, such as:

- Effective convergence of multiple networks (voice, data, storage, video, etc.) on to a single, scalable, secure converged optical infrastructure
- Mix and match of a diverse set of data networking protocols for the evolving and growing network inter-site traffic needs (data center connectivity, LAN extension, etc.)
- Storage Area Networking (SAN) extension applications for business continuity and disaster recovery, including support over SONET/SDH using GFP and Virtual Concatenation (VCAT) efficiency
- Fiber relief solutions, multiple applications carried over a single fiber pair

The 5100 and 5200 provide the capability to network applications across an open, scalable, survivable Coarse/Dense WDM (CWDM/DWDM) optical transport platform. Equipped with universal optical interfaces that can be provisioned by bit rate, the platform provides simpler network planning and reduces network operating costs. The 5100 and 5200 support one of the most comprehensive sets of optical applications and protocols, as shown in Figure 2.

Optical Ethernet	Optical Storage Connectivity
<ul style="list-style-type: none"> → Fast Ethernet (100 Base-FX) → Gigabit Ethernet (1000Base-SX, -LX) → 10GE WAN PHY PrismaDT, SD-SDI, HD-SDI, DCI (3G SDI) → 10GE LAN PHY 	<ul style="list-style-type: none"> → ESCON/SBICON → FICON/FICON Express/FC-SB-2/FICON 4G → ISC, ISC-2, HiPerLink, ISC-3 → ETR/CLO sysplex timer → FICON 1/2/4/8/10G → FC-100/200 with distance extension → PSIFB → IB-1x-SDR/DDR/QDR
Private/Leased Line	Managed Wavelength
<ul style="list-style-type: none"> → ATM, SONET (OC-1 to OC-192) → ATM, SDH (STM-1 to STM-64) → Async FOTS, PDH – 150 Mb/s, 565 Mb/s → Ethernet and Storage Private Line (GFP mapping, interwork with SONET/SDH) → Wire-speed encryption services (8/10G FC, PSIFB, 10GE LAN/WAN, OC-192/STM-64 and OTU-2) 	<ul style="list-style-type: none"> → 16 Mb/s – 10 Gb/s flexible rate → 10 Gb/s G.709 transparent wavelength (STM-64/OC192, OTU2 client) → C CIR-601/ITU-R 601, HDTV, DVB-ASI, DV6000, PrismaDT → FDDI

Figure 2. 5100/5200 supported services and protocols

Optimized Shelf and Wavelength Utilization

Common client and line interface cards are used for the 565, 5100 and 5200 that provide simpler interworking, lower sparing requirements, and overall operational savings. To benefit from maximum wavelength usage and offer lowest TCO, several sub-rate multiplexing interfaces combine different services onto a single 2.5 Gb/s or 10 Gb/s wavelength. For example, as shown in Figure 3, the 10 Gb/s Muxponder GE/FC offers up to 10 client interfaces, either Fibre Channel (FC)-100, FC-200, FICON or Gigabit Ethernet services, deterministically multiplexed to an aggregate capacity of 10 Gb/s to be carried over the WDM line with tunable lasers (across the entire C or L Band) for simplified network engineering and reduced sparing costs. Each client interface is mapped directly to an individual channel within the 10G signal through dedicated low-latency hardware, ensuring that the end-user's application is unaware of the transport equipment. These capabilities also contribute to the optimized utilization of the shelf real estate space, minimizing power utilization and overall footprint.

Encryption Services

The link encryption market is growing rapidly among security-conscious customers, including banking/finance, military and other government sectors. Like other market segments, it is also evolving away from traditional ATM, SONET/SDH and Frame link encryption services as demand grows to higher rate services, such as Ethernet link encryption at 1G and 10G. In addition, there is a growing demand for encryption solutions for any business-critical protocol as well as encrypted dark fiber solutions. The 5100 and 5200 provide a reliable and cost-effective solution to address this market in combination with the OTR 10G Quad with Encryption circuit pack. This circuit pack supports wire-speed encryption, and is equipped with multi-protocol, multi-rate tunable transponder ports capable of carrying 8/10G FC, PSIFB, 10GE LAN/WAN, OC-192/STM-64 and OTU-2 services.

5100

The 5100 is a cost-effective, footprint/power-efficient CWDM platform, designed for smaller bandwidth requirements for enterprise applications. It delivers up to 8 protected (16 unprotected) wavelengths of ITU 20 nm CWDM service per system, including flexible packaging with high availability and scalability. The 5100 has a simple architecture and is easy to deploy, considerably lowering operational costs.

The 5100 can be installed in conjunction with the 565 or the 5200 to deliver enterprise access to metro core converged WDM solutions with complete system-to-system or ring-to-ring interconnect, as shown in Figure 3.

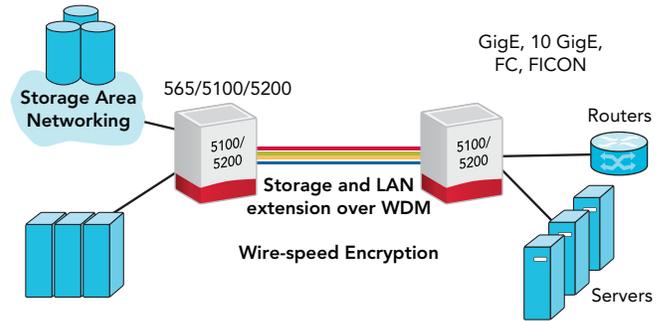


Figure 3. 565/5100/5200 application example

5200

The 5200 uses the same cards and operating software as the 5100 and the 565 while providing four times the bandwidth for higher-capacity and bandwidth-hungry applications. It delivers 48 protected (96 unprotected) wavelengths of DWDM service and also supports CWDM applications. The 5200 is a highly available (99.999 percent) platform providing application flexibility with support for extended reach applications up to 600 km without any electrical regeneration. Up to three 5200 shelves may be installed in a single 19" or 23" wide, 7-foot frame or 300 mm ETSI standard frame supporting up to 24 protected/48 unprotected 10 Gb/s or 2.5 Gb/s wavelengths per frame.

The 5100 and 5200 meet the standards set by the ETSI and the Network Equipment Building System (NEBS). The 5100 is offered with an AC rectifier option while the 5200 provides cabinet solutions for ETSI/NEBS enterprise and carrier applications.

Optical Wizard and Network Modeling Tools

The Optical Wizard is an extremely quick and easy-to-use tool which produces priced equipment lists for small and medium optical enterprise networks, based on very simple input, even in the hands of a user unfamiliar with optical link engineering. The Optical Wizard tool provides the ability to analyze input traffic demands, route traffic, allocate WDM channels for traffic demands and automatically configure required equipment and software. The output results in a high-level design which translates into an accurate budgetary estimate.

The Network Modeling tool is a powerful visual design aid and simulation tool which can then be used to fine-tune, optimize and finalize the detailed engineering design of the 5100/5200 network. It uses sophisticated algorithms to model signal power, Optical Signal to Noise Ratio (OSNR), dispersion, fiber non-linearities, jitter, coherent crosstalk and Polarization Mode Dispersion (PMD). Simulation results guarantee the performance of a network until end-of-life

and assist in the deployment, equalization and troubleshooting of the equipment in the field.

5100/5200 Basic Architecture

Figure 4 shows the basic architecture of the 5100 and 5200. Each component is described below.

- **OCI (Optical Channel Interface):** The OCI performs the client adaptation and interfaces with the numerous protocols and service types available at the metro edge. Sub Rate Multiplexing (SRM) OCI modules are deployed for optimal utilization of the wavelength (for example, the 8:1 ESCON or the 4:1 multi-protocol SRMs combine several services on a single wavelength). The OCI supports both single-mode and multi-mode fiber types.
- **Flex Rate OCLD (Optical Channel Laser and Detector):** C/DWDM interfaces provide the line optics functionality. Supports rates from 16 Mb/s to 2.5 Gb/s.
- **OTR (Optical Transponder):** Combines the functionality of the OCI and the OCLD into a single interface. Flex Rate 2.5 Gb/s OTRs and 10 Gb/s OTRs are available. Like the OCI/OCLD interfaces, OTRs can be deployed in protected or unprotected applications.
- **MOTR (Muxponder):** Combines the functionality of the OCI SRM and the OCLD into a single interface; that is, multiplexes multiple client interfaces into a single channel, and provides the WDM line adaptation, all in one card.
- **OCM (Optical Channel Manager):** Offers path-protection switching and manages the connections between the OCI and OCLD. The path protection switching is performed at the channel level, so other channels in the band are not disrupted

when a switch occurs. Two OCM circuit packs (working and protection) are equipped in the 5200 shelf. This function is assumed via the backplane on the 5100.

- **OMX (Optical Multiplexer/Demultiplexer):** Each OMX module contains passive optical filters that add and drop C/DWDM channels.
- **The Common Photonic Layer (CPL):** Provides a highly scalable mux/demux, ROADM and amplifiers for extended reach regional applications.
- **SP (Shelf Processor):** Provides local management, alarm consolidation and telemetry connections, software and configuration management, shelf visibility, performance monitoring, inventory control for the shelf and system communication.
- **OSC (Optical Supervisory Channel):** Provides a dedicated management channel that supplements the per-wavelength OSC, allowing highly differentiated fault sectionalization.

The 5200 has 16 traffic carrying slots, and the 5100 has 4 traffic slots, any of which can house the following circuit packs: OCI, OCLD, OTR, MOTR. Additional slots are provided in each platform to carry OCM (5200 only), SP and OSC cards.

Extended Reach Applications

The 5200 offers the ability to increase the reach capability of the optical layer to optimize the deployment of metro DWDM networks for distances ranging from 200 to 600 km. With this functionality, metro DWDM point-to-point, ring or mesh networks can support extended amplified distances, at both 2.5 Gb/s and 10 Gb/s line rates, without the need to perform costly intermediate electrical regeneration or Optical-Electrical-Optical (OEO) conversions. Significant network cost savings can be realized with the extended reach capability.

Network Manageability

The 5100 and 5200 is easily managed through the Web-based System Manager Interface (SMI) which offers comprehensive capabilities including a unified network view, extensive edge-to-edge wavelength provisioning, alarm reporting and performance monitoring capabilities. Local management workstations can be connected directly to a 5100 or 5200 element via a WAN or dial-up connection. Various critical network management aspects are also available via SNMP.

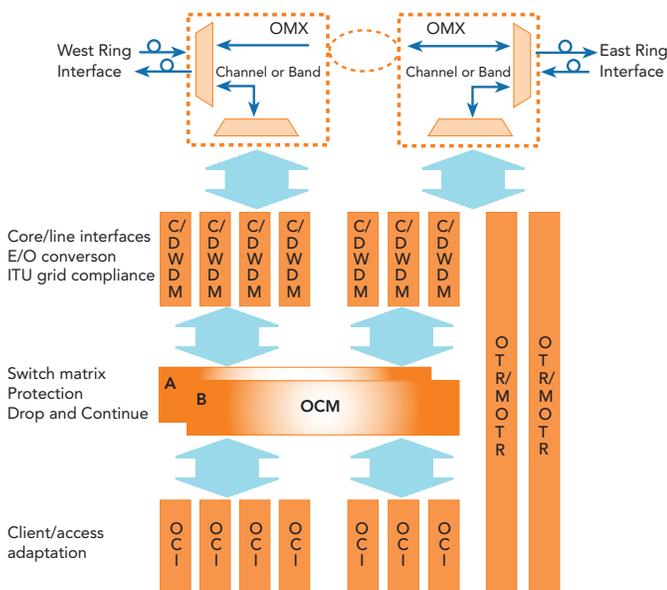


Figure 4. 5100/5200 basic architecture

Technical Information

Supported Configurations 5100 5200	8 CWDM wavelengths protected/16 unprotected per system 24 protected DWDM wavelengths (C and L Bands)/48 unprotected per frame Optical amplifiers allow for 600 km regenerator free transmission Point-to-point, linear OADM, hubbed ring, dual-hubbed ring, meshed ring
Protection Schemes	Path switching, equipment switching, line switching, unprotected
Operational Optical connectors	FC, SC, MT-RJ, LC Full C or L band tuneable 10 Gb/s Transponders/Muxponders SFP, SFP+, XFP client and SFP line side optical plug-ins 75 Ohm BNC connectors for video
Communication Ports	2 10Base-T (Ethernet) ports 1 RS-232 25-pin
External Alarms (Telemetry ports) 5100 5200	8 inputs, 4 outputs 4 inputs, 4 outputs
Element/Network Management	SNMP v1/v2/v3, TL-1, System Manager, Optical Manager Element Adaptor (OMEA)
Certifications	Zone IV (earthquake) GR-63-CORE (NEBS) Telcordia ETS 300 019 ETSI OSMINE compliant Numerous certifications with storage solutions leaders such as IBM, Brocade and EMC; please contact a Ciena sales representative for more information
Power Consumption/Shelf 5100 5200	Typical 19W, 36-99W with circuit pack[s] Typical 98W, 115-516W with circuit pack[s]
Power Requirements (nominal) Minimum Maximum AC interface available	-48 VDC -40 VDC -60 VDC
Environmental Characteristics	32° to 131°F (0° to 55°C) relative humidity 5% to 95% (non-condensing)
Physical Characteristics Shelf dimensions — 5100 Weight Shelf dimensions — 5200 Weight Universal mounting brackets for 19" or 23" frames	6.92" (H) x 17.25" (W) x 11.7" (D) 176 mm (H) x 438 mm (W) x 297 mm (D) 14.5 kg (32 lb) empty; 16.5 kg (36 lb) (fully loaded) 19.25" (11U) (H) x 17.25 in. (W) x 11.85" (D) 489 mm (H) x 438 mm (W) x 301 mm (D) 23 kg (50 lb) empty; 34 kg (75 lb) fully loaded

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